

A.20 DECISION SUPPORT THROUGH EARTH SCIENCE RESEARCH RESULTS

1. Scope of Program

1.1 Overview

The Applied Sciences Program within the NASA Earth Science Division manages this activity. This solicitation seeks proposals:

To integrate NASA Earth science research results into decision support systems serving applications of national priority and to document improvements in the performance of the decision support systems.

The overall objective of these projects is the sustained use of geosciences products and NASA Earth science research by operational organizations in their decision-making activities to benefit the nation and society.

1.2 Program Objectives

The NASA Earth Science Division serves NASA's goal to "Study Earth from space to advance scientific understanding and meet societal needs" (NASA Strategic Subgoal 3A). To that goal, the NASA Applied Sciences Program serves the NASA objective "to expand and accelerate the realization of societal benefits from Earth system science" (NASA Strategic Outcome 3A.7). Section I(a) and Table 1 of the *Summary of Solicitation* of this NRA have references to the *2006 NASA Strategic Plan* and *NASA Science Plan*.

The Applied Sciences Program enables the use of results from NASA Earth science research in operational decision support systems¹ (DSS) that organizations employ to serve their management, business, and policy responsibilities. The overarching purpose of the Applied Sciences Program is to showcase the value of NASA Earth science research and technology and to maximize the societal benefits of the nation's investments in the NASA Earth science research program.

NASA Earth science research results include Earth science measurements (particularly NASA spacecraft observations), outputs and predictive capabilities from Earth science models (particularly models that use NASA spacecraft observations), algorithms, visualizations, new knowledge about the Earth system, and other techniques and geosciences products. In conducting its research mission, the NASA Earth Science Division utilizes validated commercial remote sensing data products whenever those products can achieve the scientific objectives and are cost effective.

¹ Generally, decision support systems are interactive, computer-involved systems that provide organizations with methods to retrieve and summarize information, analyze alternatives, and evaluate scenarios to gain insight on critical factors, sensitivities, and consequences of potential decisions. Types of decision support systems might include early warning systems, planning tools, forecasts, resource allocation tools, etc.

The Program supports projects that have national impact, including regional and international activities, if they have U.S. national importance. The Program primarily supports projects involving organizations with national perspectives that have established networks to broad sets of end users and established constituencies at regional, state, local, and tribal levels. Examples of such national organizations include Federal agencies and national/regional associations (e.g., Western Governors Association, American Water Resources Association, Coastal States Organization)². The Program partners with a given national organization to identify, make, and quantify improvements to the DSS, and the partner extends the DSS and/or the improvements broadly to its constituents.

The Program focuses on extending Earth science research results to decision support systems in twelve areas of national priority:

Agricultural Efficiency	Air Quality	Aviation
Carbon Management	Coastal Management	Disaster Management
Ecological Forecasting	Energy Management	Homeland Security
Invasive Species	Public Health	Water Management

Each of these national applications has priority topics articulated in Section 5 of this appendix.

Results from projects selected through this solicitation may constitute part of NASA’s contributions to interagency, national, and international programs (e.g., U.S. Group on Earth Observations (USGEO), the international Group on Earth Observations (GEO), Climate Change Science Program (CCSP), Ocean Action Plan, and Climate Change Technology Program (CCTP)). The Program encourages teams to familiarize themselves with these and similar programs in designing a project.

The NASA Applied Sciences Program’s website (<http://science.hq.nasa.gov/earth-sun/applications>) includes more information that describe the program and its goals and provides links to other information that may support the development of a proposal.

1.3 Systems Approach

The Applied Sciences Program employs an “end-to-end” systems approach to extend Earth science research results as inputs to DSSs. The Program works together with national organizations that operate DSS to serve their mandated responsibilities and support their constituents at state, local, or tribal levels. Where research results are evaluated to have potential application, NASA and the partner organizations collaborate (in cooperation with private, academic, nonprofit, and other entities) on the systems integration and assimilation of the products into the DSSs.

Note: The NASA Applied Sciences Program – through this solicitation or otherwise – does not build nor fund the creation or development of DSSs for operational entities. The Program support projects that *enhance the performance* of existing DSSs and decision-

² The Program’s website (<http://science.hq.nasa.gov/earth-sun/applications>) provides links to a small sample of national organizations related to each national application.

making processes through the integration of NASA Earth science products. For this solicitation, the DSS in a proposal must already be in existence and/or in development by the end user organization by January 1, 2007.

Figure 1 illustrates the Integrated System Solutions (ISS) architecture that the Applied Sciences Program uses to depict the contributions of Earth observations and models to organizations' decision-making activities. A complete description and downloadable version of this chart is available at the Program's website.

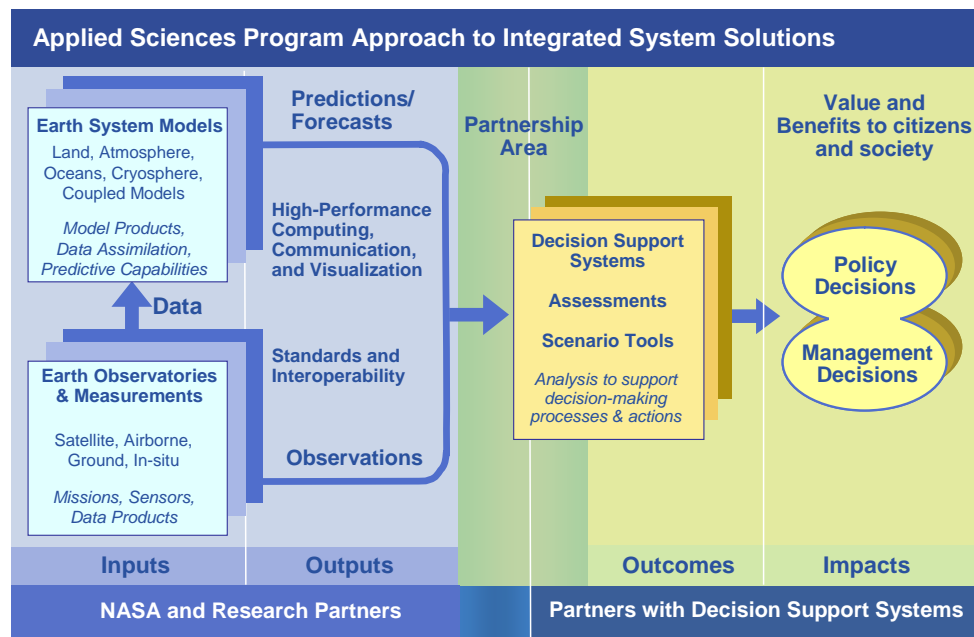


Figure 1. Integrated Systems Solutions Architecture

The Program's primary outputs include (a) "prototypes" to demonstrate the potential for integration of Earth science products in the DSSs and (b) "benchmark reports" to document the project, system configuration, and especially the improved performance of a DSS through the use of the Earth science products. The prototypes and benchmark reports are meant to facilitate the transition, adoption, and sustained use of the results in the DSSs and decision-making processes of user organizations. The Program's primary outcomes are the routine, sustained uses of NASA Earth science products in user organizations' policy, business, and management decisions to serve society. The impacts are the resulting socioeconomic benefits from the improved decisions.

The Program's website (<http://science.hq.nasa.gov/earth-sun/applications>) includes more information on the systems engineering approach and other aspects of the program that may assist in preparing a proposal.

2. Category of Projects

The Applied Sciences Program supports one category of projects through this solicitation:

- ISS projects for applications of national priority.

2.1 Integrated System Solution

The Program seeks results-oriented projects focused on the integration of Earth science research results into operational DSSs related to one or more of the twelve applications of national priority. This solicitation is flexible enough to accept application concepts and solutions at various stages of maturity. Projects should fit into the scope of the Program described in Section 1 of this appendix.

The objective of a proposed ISS project must be to assess the potential for NASA Earth science research results to integrate into and improve the DSS and associated policy, business, or management decisions. The projects should pursue innovative uses and integration of an array of Earth science results and develop and test prototype configurations to improve the DSS.

Proposed projects should be national in scope, have national impact, or have explicit plans to distribute results and improvements nationally. The projects should work to improve a DSS developed centrally by a national organization and disseminated widely for use at state, regional, local, and tribal levels, so the benefits can be accrued broadly across the nation. In some cases, the decisions and DSSs may be inherently regional (i.e., multiple states) or international in nature. In such a case, the proposal must establish the national importance of the regional or international decision making³.

Proposals must include a transition plan to enable the successful adoption of the techniques and products by the user community, so use of the Earth science results will continue after the project completion and independent of NASA funding.⁴ Proposals should demonstrate a strong interest and commitment by the end users of the DSS to adopt the results from the proposed work. Proposals may include methods for Federal agencies to transition project results by their regional offices for further extension to State, local, and tribal entities.

In identifying Earth science results to improve the DSS, proposal teams are encouraged to use NASA Earth science research results produced partially or wholly with

³ Projects that propose to focus on a local area (e.g., city, county, portion of a US State, or single state) must identify the commitment and established plan to extend the application solution broadly, must establish the national importance and impact of the issue, and must include the distribution activities in the proposal. Statements of potential value are not sufficient.

⁴ The Program recognizes that the exact specifics of a transition depend on the results achieved in the project. However, projects must describe ideas and activities appropriate to the specific user community and indicative of the commitment by the organization(s) using the decision support system.

commercial remote sensing and geospatial information. Proposals may blend commercial remote sensing and geospatial information with NASA Earth science measurements to integrate into and improve the DSS. Commercial remote sensing data that has been validated by the Joint Agency Commercial Imagery Evaluation (JACIE; <http://www.asd.ssc.nasa.gov/programs.aspx>) in support of NASA Earth science research grants should be considered NASA Earth science research results.

Note: Section 4.4 of this appendix provides guidance on specific information to include in a proposal, and Section 4.6 of this appendix specifies reporting requirements for projects.

2.2 Specific Suggestions and Considerations

The Program strongly encourages projects to use an array of Earth science research results, including multiple spacecraft observations, geophysical parameters, and Earth system models and predictive capabilities. The Program encourages project teams to consider and use products from recently-launched NASA missions (e.g., Ice, Clouds, and Land Elevation Satellite (ICESat), Aura, Gravity Recovery and Climate Experiment (GRACE), CloudSAT, and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO)) as well as simulated products from upcoming, planned missions (e.g., Ocean Surface Topography Mission (OSTM), Aquarius, NPOESS Preparatory Project (NPP), Glory, Global Precipitation Measurement (GPM), Landsat Data Continuity Mission (LDCM), and Orbiting Carbon Observatory (OCO)).

The Applied Sciences Program website includes other specific suggestions that proposing teams may wish to review and consider in developing a proposal.

3. Programmatic Information

The Program seeks proposals for new projects that fall within the scope of the ISS projects description. Based on proposal review, program balance, and availability of funds, NASA may not necessarily fund projects in all of the twelve national applications. Projects will begin in Fiscal Year 2008.

Total Amount of Funding (FY08-10)	\$15-30M total (\$5-12.5M per annum)
Anticipated Number of Awards	16 – 45 projects
Expected Range of Award per project	\$240K - \$320K per annum
Period of Performance	up to 3 years
Expected Project Start Date	On or before January 1, 2008
Contributions from Partner Organizations	Strongly encouraged. However, partner funding does not count toward funding level guidelines.

4. Amendments and Clarifications to the *Summary of Solicitation*

The following information provides clarifications or amendments to the *Summary of Solicitation* of this NRA. The information below supersedes direction provided in the respective sections of the *Summary of Solicitation*.

4.1 Funding Policies: Changes to Section II(a) of the *Summary of Solicitation*

This solicitation is for new awards. NASA will not accept proposals for successor proposals to solicited projects whose periods of performance are ending nor proposals for supplemental funding of existing, solicited projects in response to this solicitation. Awards will be in the form of grants, cooperative agreements, contracts, and intra- or inter-agency transfers. The Applied Sciences Program prefers cooperative agreements for the ISS projects; proposing teams may request a specific type of award. A NASA awards officer will determine the appropriate award instrument for each proposal selection.

For cooperative agreements, the proposal should describe the support envisioned from NASA. NASA will work with the awardees regarding Earth research results, observations, models, data management issues, interoperability standards, and other relevant activities. NASA expects to work with the awardees regarding the systems engineering approach, results workshops, and guidance on benchmarking standards. NASA capabilities in support of the science, systems engineering, and interoperability standards are available at the NASA Centers, as described in the NASA Earth Science Strategic Plan at <http://science.hq.nasa.gov/strategy>.

4.2 Eligibility of Applicants: Changes to Section III(a) of the *Summary of Solicitation*

Teams of organizations and collaborations spanning organizational sectors (e.g., academia, private, Federal, public, nonprofit, etc.) and expertise (e.g., technical, management, scientific, etc.) are strongly encouraged and recommended⁵. When Federal agencies are part of a proposal team, the Program strongly encourages non-Federal organizations (e.g., companies, academic institutions, nonprofits) to also be part of teams.

End user organizations (e.g., organizations that use the DSS to support their decision-making responsibilities) must be explicitly identified and involved as active collaborators, participants, and/or leaders in the team. If a project involves Federal agencies and/or national organizations that make improvements centrally to a widely used DSS that other end-user organizations will employ, then representatives of the end-user organizations must be actively involved in the project design and execution.

⁵ A primary purpose of a multi-sector teaming approach is to build skill and capacity in the community and to support the sustained use of Earth science results, especially after the completion of NASA project funding.

4.3 Cost Sharing or Matching: Changes to Section III(c) of the *Summary of Solicitation*

Contributions and cost sharing from proposing institutions and partner organizations is highly encouraged but not required. The Program accepts in-kind contributions during the course of the project as cost sharing. Relevant past work, prior results, or previous support and accomplishments can be described, but the Program does not consider these as cost sharing or in-kind contributions for proposals to this solicitation.

4.4 Proposal Format and Contents: Changes to Section IV(b)(ii) of the *Summary of Solicitation*

Proposals should adhere to the following page guidelines and order. Content descriptions, if specified below, modify Section 2.3 of the *NASA Guidebook for Proposers*.

Proposal Cover Page	As found on NSPIRES site or Grants.gov (includes budget summary)
Proposal Summary	300 words (included in cover page)
Table of Contents	1
Decision Support System – Description and Baseline Performance.....	2
Earth Science Research Results	1
Technical/Scientific/Management Section (including charts/figures/tables).....	12
- Integrated System Solution Chart (required)	
- Figures and Tables (as appropriate; integrated into text if possible)	
Transition Approach/Activities	1
Performance Measures	1
Anticipated Results/Improvements	1
Project Management Metrics.....	1
Schedule	1
Statements of Commitment – Co-Is	as needed
Letters from End-User Organizations	4, one-page letters
Budget Justification: Narrative and Details	as needed
Facilities and Equipment (if applicable)	1
Curriculum Vitae: Principal Investigator	2
Each Co-Investigator	1
Current/Pending Support	as needed
References and citations.....	2

Proposal Summary

In addition to the information listed in the *NASA Guidebook*, this section must explicitly state which of the twelve applications of national priority the proposal relates to (if more than 2, then only identify the top 3). For the primary national application(s) related to the project, this section should state how the project responds and relates to the priorities identified in Section 5 of this appendix.

Decision Support Overview/Baseline

This section must explicitly identify and describe the DSS to be enhanced in the project. The description should discuss the DSS and the management/policy topic or issue that it serves (e.g., water resources allocation, energy load forecasting, and fishery stock rebuilding), including any quantitative information regarding its use. This section must identify and describe the end-user organization(s) and their responsibility and/or mandate to address the topic/issue.

This section should answer the following questions: What is the end-users' current basis for decision making? What is the DSS? Who uses the DSS? How do they use it in their decision-making process? What analyses, actions, and decisions does the DSS support? What measures/metrics do the DSS-users employ to determine the value or quality of their decision making and the DSS? What are the reasons and needs for improving the DSS? What is the pre-project (aka, baseline) state of the end-users' decision-making activities and their use of the DSS?

This section must quantify the pre-project, baseline performance of the decision support system, using the end-users' measures as well as other quantitative measures the team plans to employ throughout the project to track progress.

Earth Science Research Results

This section must identify the array of Earth science research results (Section 1.2 of this appendix) that the proposal seeks to integrate into and improve the DSS. Proposals must be specific. For spacecraft observations, proposals should include the spacecraft, sensor, data product, and other specific information. For proposals involving Earth science models, this section should identify the inputs to the models as well as the predictions, forecast products, or other products from the models. For proposals involving NASA Earth science research results produced with commercial remote sensing data and geospatial information, proposals must identify the commercial inputs and sources. For proposals blending commercial products with NASA products, proposals should identify all the data and products.

Technical/Management/Scientific Section

As the main body of the proposal, this section should cover the following material:

- Relevance of the proposed work to NASA's *Strategic Goals and Outcomes* given in Table 1 in the *Summary of Solicitation* of this NRA;
- Objectives of the proposed activity;
- Technical approach and methodology to be employed, including discussion of the innovative aspects;
- Rationale for NASA Earth research results to be integrated, including discussion of innovative aspects and potential impact to decision making;
- Design of an integrated system solution to improve the DSS
- Systematic approach to integrate Earth science results into the DSS;
- Approach to develop and test the integrated system solution and address integration problems (technical, computational, organizational, etc.);

- Approach to characterize uncertainty in the integrated system and DSS outputs;
- Approach to quantify improvements in the system performance;
- Approach to quantify (or quantitatively estimate) the socioeconomic value and benefits from the resulting improvements in decision making;
- Management approach and structure, plan of work, partnership arrangements, and the expected contribution, roles, and responsibilities of the team members;
- Challenges and risks affecting project success (technical, policy, operations, management, etc.) and the approach to address the challenges and risks; and
- Relevant tables/figures that demonstrate key points of the proposal.

The proposal must include a populated version of an ISS diagram that depicts the project; diagrams should be as detailed and specific as possible; a version to download is available at <http://science.hq.nasa.gov/earth-sun/applications>.

Transition Approach/Activities

This section should articulate the transition plan, including specific activities to enable the end-users to adopt the DSS enhancements and sustain their use of the Earth science products within the timeframe of the project. For projects below the national level, this section must describe the activities to extend the results broadly.

Performance Measures

This section must articulate the measures (both quantitative and qualitative) the team will use to determine the outcomes, results, and value of the project. The measures should establish the potential improved performance of the DSS through the integration of the Earth science research results. The measures should include those that the DSS-users employ as well as those used to establish the baseline performance of the DSS. The Program website has information and examples of performance measures.

Anticipated Results

This section must describe the expected results from the project. This section should articulate the expected quantitative improvement(s) over the “baseline” performance of the DSS. This section should estimate the expected improvement(s) in decision making enabled from the enhanced DSS and the associated socio-economic benefits from the improved decision making. This section should be as specific, descriptive, and quantitative as possible.

This section should identify how the expected results will contribute to the specific goals and objectives of the related national application. This section should also identify how the project results might support NASA contributions to interagency and international programs, especially NASA contributions to the GEO and USGEO societal benefit areas, 2007-2009 task plan, and/or USGEO near-term opportunities.

Project Management Metrics

This section should articulate the metrics and indicators the project team will use to monitor the progress toward the project’s objectives and milestones. The team should use these metrics to identify and track problems and to determine if the project is on schedule, on budget, on task, etc. The Program website has information and suggestions

about performance measures. *Note: Meetings (number of, frequency of, etc.) do not qualify as project management metrics.*

Statements of Commitment

In addition to the brief statements from Co-Is required per Section 2.3.10 of the *NASA Guidebook for Proposers*, this section may include up to 4, one-page letters of commitment from the end-user organizations that will benefit from the proposed project. The letters may include input from the community and beneficiaries served by the end user organizations. All statements or letters must be addressed to the PI and included in the proposal. The Program website has suggestions about information to include in the end users letters of commitment.

Budget

The NASA Science Mission Directorate has adopted commercial data purchases as a mainstream way of acquiring research-quality data, as these commercial capabilities become available. Per NASA policy, NASA encourages the use of commercially available data sets by Principal Investigators as long as it meets the scientific requirements and is cost-effective. In addition to the budget guidance in the *Summary of Solicitation*, the proposal should identify the commercial data sources intended for use and details on the associated cost.

4.5 Evaluation Criteria: Subfactors for Section V(a) of the *Summary of Solicitation* and Section C.2 of the *NASA Guidebook for Proposers*

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion “relevance to NASA's strategic goals and objectives” specifically includes the following factors:

- Overall ability to showcase the value and benefits of NASA Earth science research;
 - Overall ability to address a topic of national importance;
 - Overall ability to address one or more of the Program’s national applications and the priority topics identified in Section 5 of this appendix;
 - Overall ability to employ Earth science research results (including those using commercial data and geospatial information) to make valuable, substantive improvements to the DSS and decision-making processes;
 - Overall ability to employ NASA Earth science model products, observations from recent NASA Earth science spacecraft and sensors, and simulated products from future planned NASA Earth science sensors;
 - Overall ability to achieve the routine, sustained use of NASA Earth science results by the operational entity in their DSS and processes;
 - The national breadth and impact of the project (preference is given to projects with broader impact to many regions, States, localities, and tribal entities);
 - Overall ability for project results to support NASA contributions to GEO, USGEO, and other interagency and international organizations NASA supports;
- and

- Extent of the socio-economic value and benefits (estimated or actual) realized from NASA Earth science results (including those integrated with commercial data and geospatial information) to improve DSSs and decision making.

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion "intrinsic merit" specifically includes the following factors:

- Overall quality of the project design, innovation, and thoroughness in implementation to achieve project goals and meaningful results;
- Characterization and quantification of the baseline performance of the DSS and end users' decision making;
- Overall plan and ability to integrate Earth science results to the DSS and address technical integration and interoperability issues;
- Overall plan and ability to use an array of Earth science research results (including ones using commercial data and geospatial information, if applicable);
- Overall plan and ability to use Earth science model outputs and model predictive capabilities, especially NASA-sponsored models or models using NASA spacecraft measurements;
- Overall plan and ability to employ NASA Earth science spacecraft measurements, especially those from more recent NASA Earth science missions and sensors and/or simulated products from future planned missions;
- Extent of teaming across sectors (public, private, academic, non-profit, etc.), the extent of non-Federal organizations participation in the project, and the extent of involvement of user organization(s) in the proposed project;
- Overall plan and ability to employ systems engineering principles;
- Overall plan and ability to characterize uncertainty in the integrated system and DSS outputs;
- Overall plan and ability to determine, demonstrate, and quantify improvements to the performance of the DSS (baseline vs. improved states of the DSS); and
- Overall ability to quantitatively assess the value of NASA Earth science results in the DSS, the associated decision making, and the resulting societal benefits.

In addition to the factors given in the *NASA Guidebook for Proposers*, the evaluation criterion "cost realism" specifically includes the following factors:

- The degree to which the proposed project follows a well-constructed plan and approach to manage the project;
- Overall plan and ability to identify and use effective project management metrics; and
- Overall plan and ability to identify and use effective performance measures.

Cost sharing is not part of the proposal evaluation criteria. At the time of project selection when deciding between proposals of otherwise equal merit, NASA will consider the extent to which the proposed project includes funds or in-kind contributions from non-Federal sources and Federal agencies, consistent with Section 4.3 of this appendix and Section III(c) of the *Summary of Solicitation*.

4.6 Award Reporting Requirements: Changes to Section VI(c) of the *Summary of Solicitation*

The following reports will be required of awarded proposals. In cases where teams of organizations or subcontracts exist, consolidated project reports, including financial records, must be submitted and is the responsibility of the lead organization. The proposed budget should provide for these reporting requirements.

Quarterly Reports – Financial and Performance

Quarterly reports should provide an overall, summarized assessment of the project with summarized information on the following: major activities and accomplishments of preceding 3 months, schedule status, assessment of project development (and basis for that assessment), project management metrics, planned vs. actual financial activity, and performance measures. The report should be approximately 1-2 written pages, with the actual length depending on the level of activity. The report should indicate any changes to the ISS diagram. The first report should include a project plan for technical, schedule, and resource activities for the project; the first report may include discussion of issues or needed clarifications identified in the contract negotiations.

Projects may include a one-page chart with four sections (a.k.a., quad chart) to communicate Major Accomplishments and performance measures; Major milestones; Risks, risk mitigations, and project metrics; and, Issues and action items to address. The Program will work with the project team on an appropriate format.

Demonstrations and Prototypes

Projects should plan for at least two demonstrations to show technical results and status: At least one demonstration should show the configuration and performance of the prototype, and at least one demonstration should show the use and performance of the enhanced DSS in the end users' operational environment. Plans for delivery of project prototypes, algorithms, etc. to NASA and partner agencies should be consistent with the *NASA Data and Information Policy*. This policy is available at http://eosps0.gsfc.nasa.gov/ftp_docs/handbook99.pdf.

Final Report / Benchmark Report

The final report should be a benchmark report to address the following:

- Analysis of DSS performance with the Earth science results compared to the baseline (i.e., performance “with and without” the Earth science results);
- System configuration diagram;
- Results of feasibility evaluation(s) and issues encountered and resolved during verification and validation;
- Integration issues and interoperability issues encountered and resolved;
- Robust documentation of procedures and guidelines describing the steps to access, integrate, and utilize the Earth science research results;
- Lessons learned;

- Quantitative and qualitative enhancements to the DSS and related decision making;
- Resource estimate for the user organizations' adoption and sustained use of the Earth science products;
- Recommendations and remaining issues facing the sustained use of the Earth science data in the enhanced DSS by the partner agency and end users; and
- Quantitative and qualitative socio-economic benefits (actual or estimated) from the improved decision making enabled by the project and enhanced DSS.

The *Grant and Cooperative Agreement Handbook - Exhibit G* references the standard required reports for cooperative agreements (<http://ec.msfc.nasa.gov/hq/grcover.htm>); specific reporting requirements, if different from above, will be articulated in the cooperative agreement.

Workshop

The project should plan to travel and participate in a Program-sponsored results conference to disseminate the lessons learned from the project as widely as feasible. The Applied Sciences Program will coordinate this activity with project team during the course of the project; however, the project should budget accordingly to attend this event.

Distribution of Reports and Presentation Packages

During contract negotiation, NASA representatives will discuss methods, including electronic reporting, to transmit the reports and presentation packages. The NASA Shared Services Center (NSSC) will also solicit and archive the annual reports and final report.

5. Priority Topics for the Twelve National Applications

This section provides a brief description of the scope of activity and priority topics desired through this solicitation for each of the twelve applications of national priority (listed in reverse alphabetical order).

Points of contact for each of these applications are listed in Section 6 of this appendix, and the program plans for the applications are available at <http://science.hq.nasa.gov/earth-sun/applications>. Proposal teams should contact the points of contact with questions or for clarifications.

5.1 Priority Topics

5.1.1 Water Management

The Water Management program extends Earth science results to enhance DSSs related to water quantity and quality, and the program has organized its activities around four themes: Water Quality, Water Delivery and Irrigation, Drought, and Flow and Flood Forecasting. In this solicitation, the program requests proposals related to Drought and Water Quality.

For drought-related projects, the program strongly suggests that proposals focus on enhancing DSSs related to short-term drought forecasts and seasonal predictions (rather than monitoring current conditions). Proposers should become familiar with the USGEO activity on drought, including the National Integrated Drought Information System (NIDIS). The program specifically encourages proposals that use GRACE data and associated modeling efforts to improve DSSs in the management and long-term planning of aquifers and underground water storage. The program requests projects related to the USDA Drought Insurance Program. For water quality projects, the program allows activities from coastal to inland waters, including the Great Lakes. In addition to promoting the use of model products, the program strongly encourages innovative projects to improve water management DSSs through direct spacecraft measurements of water quality.

In cooperation with Energy Management, the program strongly encourages projects related to renewable energy activities/DSSs that utilize water management products (e.g., hydropower). Given the program's current portfolio, the program specifically discourages proposals focused on flooding. In addition, projects proposing to use Moderate Resolution Imaging Spectroradiometer (MODIS) and Landsat must use other sensors (especially more recent or upcoming sensors) and model products in addition to these. The Program strongly encourages all projects to involve an array of Earth science models and sensors, including under-represented missions in the water management portfolio, such as GRACE, Jason-1, and CloudSat, and it encourages proposals to consider future sensors, such as Aquarius, NPP, and OSTM.

5.1.2 Public Health

The Public Health program extends Earth science research results to enhance DSSs for public health, medical issues, and environmental health issues. The program's foci of partnerships with the public health community are their DSSs known as Epidemiologic Surveillance Systems in the areas of infectious disease, environmental health, and emergency response and preparedness.

In this solicitation, the program specifically requests proposals in the areas of asthma/respiratory health, avian influenza, oceans and human health, and emergency response/preparedness (including bioterrorism). Given the Public Health program's current portfolio, the program discourages proposals focused on malaria.

5.1.3 Invasive Species

The Invasive Species program extends Earth science research results to enhance DSSs related to the control of invasive species. For this solicitation, the program requests proposals to support priorities established by the National Invasive Species Council (NISC) and/or priorities addressed by one or more of the agencies represented on the NISC and responsible for invasive species management, especially EPA, USGS and

USDA. Proposals must address the decision-making processes of the operational user(s) and may also include one or more of the following components:

- Development of predictive maps, national in scale, of the potential extent of high-priority species (where the “priority species” is determined by the NISC and/or partner agency/agencies);
- Increases in efficiencies (i.e., the speed and accuracy) of monitoring and mapping associated with the decision-making processes; and/or
- Increases in the precision and accuracy of invasive species maps, and integration of the precision and accuracy information into the decision support system.

To the extent possible, proposals should make use of existing or developing tools, such as the National Invasive Species Forecasting System (<http://www.niiss.org>) or the NISC Invasive Species Compendium (<http://www.cabi.org/compendia.asp>). The program encourages proposals that enhance, through the use of NASA Earth science results and related capabilities, projects awarded and in progress, or under consideration, through separate solicitations proffered by other Federal agencies, such as EPA, USGS and USDA.

5.1.4 Homeland Security

The Homeland Security program extends Earth science research results for terrorism response and homeland security preparedness, response, and mitigation. For this solicitation, the Homeland Security program specifically requests proposals focused on air plume transport and dispersion, aquatic or hydrologic contamination prediction or monitoring, and food security/insecurity monitoring or prediction. Thus, proposals to Homeland Security may also be associated with the Air Quality, Water Management, or Agricultural Efficiency applications, and the proposals should identify their dual-use nature.

The program especially encourages proposals involving products from recent NASA missions (such as GRACE, CloudSAT, CALIPSO, and Aura). The program encourages proposals to consider future systems (such as OSTM, OCO, LDCM, Aquarius, Glory, GPM, and NPP) through simulated products or direct data sets, depending on scheduled launch date. The program strongly advises proposals that involve products from NASA “extended mission” satellites and/or foreign satellites to also involve products from recent or future NASA systems.

5.1.5 Energy Management

The Energy Management program extends NASA Earth science research results (historical, near real-time, and forecasted) to support energy management decisions and scenarios related to energy production, energy efficiency, greenhouse gases, and energy-related carbon sequestration. The program endeavors to maintain alignment with the GEO Energy societal benefit area and the CCTP Strategic Plan (<http://climatetechnology.gov>).

In this solicitation, the program specifically encourages proposals focused on enhancing DSSs related to energy supply and load forecasting, climate change impacts on the energy sector, and distributed energy generation, particularly renewable energy, including hydroelectric and ocean energy (e.g., wave, tidal). In cooperation with Water Management, the program strongly encourages projects related to renewable energy activities/DSSs that utilize water management products (e.g., hydropower).

In addition to recent NASA sensors, the program encourages proposals to consider the use of upcoming NASA missions (such as Aquarius, Glory, OCO, and GPM; actual or simulated data sets) as well as Earth science model products and predictive capabilities.

5.1.6 Ecological Forecasting

The Ecological Forecasting Program extends NASA Earth science research results to enhance DSSs related to predictions and impacts of environmental change on terrestrial and aquatic ecosystems for the purposes of biodiversity conservation and sustainable development. For this solicitation, the Ecological Forecasting program requests proposals in the areas of regional conservation and sustainable development, protected area management, and marine fisheries forecasting.

For regional conservation and sustainable development projects, the program seeks proposals that will provide additional capabilities to Mesoamerican Regional Visualization and Monitoring System (SERVIR), especially enhancements to its biodiversity conservation applications (<http://servir.nsstc.nasa.gov/>). This solicitation also seeks proposals that will extend the SERVIR approach to regions outside Central America.

For protected area management projects, the program seeks proposals to improve existing DSSs for monitoring and assessing biodiversity at regional, national, or international scales. Proposed projects should involve U.S. government agencies and/or international organizations with mandates for biodiversity monitoring and assessment. The program strongly encourages proposals to align with GEO and its Biodiversity societal benefit area and to support U.S. contributions to GEO Work Plan, which calls for the implementation of strategies for biodiversity observation and monitoring that would enable assessments of the trends in and distributions of species and ecosystems of conservation merit.

For marine fisheries projects, the program seeks proposals focused on enhancing existing DSSs related to the management of living marine resources, such as stock assessments and habitat classifications. The program encourages projects to include representatives of NOAA Fisheries and/or U.S. Regional Fishery Management Councils. The program encourages proposals to include and utilize NASA-supported Earth science ecological models. This topic area is managed jointly with the Coastal Management program.

Ecological forecasting requires the application of both observations and models. Proposals with an exclusive focus on satellite observations and lacking the use of ecological models and/or Earth system models will not be responsive to this solicitation.

5.1.7 Disaster Management

The Disaster Management program extends Earth science results for disaster management preparedness, prediction, risk, response, and mitigation in the areas of wildfire, drought, earthquakes, tsunami, volcanoes, deformation/landslide, hurricanes/tropical storms, severe storms, tornadoes, lightning, and flooding.

For this solicitation, the program encourages proposals focused on enhancing the NOAA National Weather Service Advanced Weather Interactive Processing System (AWIPS) Next Generation System (aka, AWIPS-II) for disaster management applications.

For this solicitation, the program also encourages proposals focused on enhancing DSSs for disaster management applications in an international context. The program encourages proposals associated with Africa and addressing issues of sustainability. The Disaster Management website (link on the Applied Sciences Program site) includes information on example DSSs, and proposals are not limited to those. Projects focusing on international activities should have one or more Federal agency partner(s) on the team.

The program especially encourages proposals involving products from recent NASA missions (such as GRACE, CloudSAT, CALIPSO, and Aura). The program encourages proposals to consider future systems (such as OSTM, OCO, LDCM, Aquarius, Glory, GPM, and NPP) through simulated products or direct data sets, depending on scheduled launch date. The program strongly advises proposals that involve products from NASA “extended mission” satellites and/or foreign satellites to also involve products from recent or future NASA systems.

5.1.8 Coastal Management

The Coastal Management program extends Earth science research results to DSSs addressing issues associated with coastal and oceanic environments (including estuaries, near-shore, marine, large inland waters, reefs, etc.). The program has focused its activities to five areas: coastal hazards, resource management (particularly living marine resources), ecosystem management, water quality, and coastal planning associated with sea level change. For this solicitation, the program encourages proposals to enhance existing DSSs in all five areas.

In resource management, the program strongly encourages projects focused on enhancing DSSs related to the management of marine fisheries, such as stock assessments. The program encourages these fisheries proposals to incorporate NASA-supported Earth science ecological and geophysical models. This topic area is managed jointly with the Ecological Forecasting program. In hazards, the program encourages projects addressing hypoxia and encourages projects involving the US Coast Guard (e.g., search and rescue).

In planning, the program encourages projects on planning associated with sea level change impacts (e.g., subsidence, intrusion, inundation); these projects should incorporate products and predictive capabilities from NASA-supported Earth science models. In Ecosystem management, the program encourages projects related to wetlands/estuaries management and restoration. In water quality, the program encourages projects related to urban/coastal pollution as well as innovative projects to improve DSSs through direct spacecraft measurements of water quality (in conjunction with Water Management).

Since coastal issues are often regional in nature, the Coastal program will accept proposals focused on regional DSSs. In these cases, the proposed project must articulate the national importance of the regional area. Since the program's portfolio currently includes significant efforts focused on the Gulf of Mexico and harmful algal blooms, the program strongly requests projects focusing on other regions and topics. The program discourages projects that focus exclusively on coastal mapping.

The program strongly encourages all proposals to use Earth system models and model predictive capabilities. The program strongly suggests that proposers familiarize themselves with priorities identified in the U.S. Ocean Action Plan (<http://ocean.ceq.gov/actionplan.pdf>) and the related Subcommittee on Integrated Management of Ocean Resources (SIMOR; <http://ocean.ceq.gov/about/simor.html>).

5.1.9 Carbon Management

The goal of carbon management is to affect the carbon cycle through resource management decisions and/or development and implementation of policies that lead, in the near term, to the stabilization of, and, in the long term, to the reduction of carbon compounds in the atmosphere that contribute to global warming. The Carbon Management program element supports this goal through projects that integrate NASA Earth science research results into carbon management decision-making processes and DSSs.

For this solicitation, the program strongly encourages proposals with one or more of the following components:

- Use of existing NASA-supported tools for terrestrial carbon and ecosystem evaluations (e.g., Carbon Query and Evaluation Support Tools (CQUEST) and Terrestrial Observation and Prediction System (TOPS)) in carbon management decision processes that impact carbon management at regional to national levels;
- Extend NASA Earth science capabilities to existing decision support systems and processes related to carbon management; and/or
- Enhance carbon management DSSs employed at the state to regional level that are supported and distributed by a national agency, organization, or user network.

In addition, the program strongly encourages proposals to assess and incorporate contributions from recent and upcoming missions and Earth system models.

5.1.10 Aviation

The Aviation program extends Earth science research results to support the National Airspace System (NAS), specifically in the areas of safety, capacity, security, and environmental issues.

For this solicitation, the Aviation program specifically requests proposals in the areas of Numerical Weather Prediction (NWP) enhancement and space weather. Space weather proposals should focus on enhancing partner-owned decision support tools that concern radiation impacts on the crews and passengers of long-range aircraft.

In addition, the program encourages proposals to align with the “Next Generation Air Transportation System” Plan submitted to Congress in December 2004 by the inter-agency Joint Planning and Development Office (<http://www.jpdo.aero>).

5.1.11 Air Quality

The Air Quality program extends Earth science research results to air quality DSSs, and the program focuses its activities according to four themes: use of Earth science products in support of Air Quality Planning, Forecasting, Emissions Inventories, and Compliance (with air quality standards and policies). Generally, planning activities are targeted at assessments, policy development, implementation plans, and control strategies to improve air quality; emissions inventory activities focus on enhancing emissions inventories for enhancement of and use in air quality DSSs. The program primarily focuses on efforts directly or indirectly related to the criteria pollutants.

For this solicitation, the program requests proposals focused on air quality Compliance, Planning, Emissions Inventories, and particular aspects of Forecasting. In Forecasting, the program principally requests proposals focused on enhancing the Global Forecasting System. Since the program’s portfolio currently includes significant MODIS-based aerosol activities, the program discourages forecasting proposals focused narrowly on MODIS-based aerosol/Particulate Matter (PM) forecasting (including VIIRS). In Planning, the program encourages a broad range of project concepts, including activities related to regional haze as well as use of land characteristics in air quality DSSs. In Compliance, the program encourages a broad range of project concepts, including activities to use Earth science results to support accountability efforts and assess policy effectiveness in addition to compliance assistance.

Since the program’s portfolio already includes significant MODIS-based aerosol activities, the program discourages proposals focused narrowly on MODIS-based aerosol/PM forecasting. The program encourages proposals involving multiple Regional Planning Organizations, Federal agencies, and/or major national associations, such as the National Association of Clean Air Agencies. The program strongly encourages proposals to consider simulated products from upcoming missions.

5.1.12 Agricultural Efficiency

The Agricultural Efficiency program extends NASA Earth research results to support DSSs and processes used to monitor and manage agricultural resources. For this solicitation, the Agricultural Efficiency program encourages proposals that focus on one or more of the following components:

- Incorporate NASA climate model products and related observations, measurements and data products to initialize and calibrate existing models for crop stage development and crop productivity and yield predictions;
- Enhance existing agricultural efficiency DSSs employed at the state to regional level that are supported and distributed by a national agency, organization, or user network;
- Use NASA capabilities in international efforts related to agricultural decision support, including USGEO and GEO. Projects focusing on international activities should involve one or more U.S. Federal agency partner(s) on the team; and/or
- Incorporate on-going and completed Earth science results that support more timely, accurate and accessible observations critical to agriculture, including land cover, field boundaries and total crop land area, crop stage or phenology, and crop residue.

In addition, the program strongly encourages proposals to assess and incorporate contributions from recent and upcoming missions to enhance existing DSSs and decision support processes and/or improve the performance of existing crop models used in decision support. The program is especially interested in proposals that interact with NASA Earth science research focus areas and other Applied Sciences program elements that overlap with agricultural issues.

5.2 Additional information

The NASA Applied Sciences Program collaborates with the U. S. Department of Agriculture (USDA) on the identification and integration of NASA Earth science capabilities into decision support systems of operational agencies within USDA. Working groups have identified priority Earth science requirements and application candidates for eight of the applications of national priority. Information is available at: <http://www.asd.ssc.nasa.gov/pships/usda.aspx>. For projects proposing to these priorities, the Applied Science Program encourages the use of NASA Earth modeling capabilities.

6. Summary of Key Information

Expected program budget for new awards	See Section 3 of this appendix.
Number of new awards	See Section 3 of this appendix.
Maximum duration of awards	3 years
Due date for Notice of Intent	See Tables 2 and 3 in the <i>Summary of Solicitation</i> (as amended) of this NRA

Due date for Proposals	See Tables 2 and 3 in the <i>Summary of Solicitation</i> (as amended) of this NRA
NASA strategic objective(s) which proposals must state and demonstrate relevance to	Every proposal must address one or more strategic goal(s) or research objective(s) from Table 1 in the <i>Summary of Solicitation</i> of this NRA. See Section 1.2 of this appendix. See also Sections I(a) and IV(e) in the <i>Summary of Solicitation</i> of this NRA.
General information and overview of this solicitation	See <i>Summary of Solicitation</i> of this NRA.
Detailed instructions for the preparation and submission of proposals	<i>Guidebook for Proposers Responding to NASA Research Announcement – 2007</i> at http://www.hq.nasa.gov/office/procurement/nraguidebook/ . See also Section 4.4 of this appendix for content guidance and amendments.
Page length for the central Science-Technical-Management section of Proposal	See Section 4.4 of this appendix and also Chapter 2 of <i>NASA Guidebook for Proposers</i> . Proposers are required to generate an Integrated System Solutions diagram to portray and illustrate their project (see http://science.hq.nasa.gov/earth-sun/applications for an example and a version to download)
Submission medium	Electronic proposal submission is required; no hard copy is required. See also Section IV in the <i>Summary of Solicitation</i> of this NRA and Chapter 3 of the <i>NASA Guidebook for Proposers</i> .
Web site for submission of proposal via NSPIRES:	http://nspires.nasaprs.com (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov:	http://grants.gov (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH07ZDA001N-DECISIONS
Point of contact concerning this program	Mr. Marty Frederick Applied Sciences Program Earth Science Division Science Mission Directorate NASA Headquarters Washington, DC 20546-0001 Telephone: (202) 358-0913 E-mail: martin.frederick-1@nasa.gov
Additional points of contact for the twelve National Applications	<u>National Applications – General Information on Integrated System Solutions</u> Lawrence Friedl Telephone: (202) 358-1599 E-mail: Lawrence.A.Friedl@nasa.gov

	<p><u>Agricultural Efficiency, Carbon Management, Invasive Species</u> Edwin Sheffner Telephone: (202) 358-0239 E-mail: Edwin.J. Sheffner@nasa.gov</p> <p><u>Air Quality, Coastal Management, Water Management</u> Lawrence Friedl Telephone: (202) 358-1599 E-mail: Lawrence.A.Friedl@nasa.gov</p> <p><u>Aviation, Public Health</u> John Haynes Telephone: (202) 358-4665 E-mail: jhaynes@nasa.gov</p> <p><u>Disaster Management, Homeland Security</u> Stephen Ambrose Telephone: (202) 358-0851 E-mail: sambrose@nasa.gov</p> <p><u>Ecological Forecasting</u> Woody Turner Telephone: (202) 358-1662 E-mail: Woody.Turner@nasa.gov</p> <p><u>Energy Management</u> Richard Eckman Telephone: (757) 864-5822 E-mail: Richard.S.Eckman@nasa.gov</p>
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